CLAIMS

1. A method for deriving sample timing for a plurality of signal instances received on a plurality of antennas at a receiver unit in a wireless communication system, comprising:

estimating a signal quality of each of the plurality of signal instances;

comparing the estimated signal qualities of the plurality of signal instances;

selecting one of the plurality of signal instances based on a result of the comparing;

updating a loop filter based on an error metric derived for the selected signal instance; and

deriving the sample timing for the plurality of signal instances based on an output of the loop filter.

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2. The method of claim 1, further comprising:

deriving the error metric for the selected signal instance with an early/late discriminator and based on data samples for the selected signal instance.

3. The method of claim 1, further comprising:

deriving an error metric for each of the plurality of signal instances; and

selecting the error metric for the selected signal instance to update the loop filter.

4. The method of claim 1, wherein the error metric for the selected signal instance is indicative of an instantaneous error in the sample timing for the selected signal instance.

5. The method of claim 1, wherein the loop filter is part of a delay lock loop used to derive the sample timing for the plurality of signal instances.

6. The method of claim 1, wherein the signal quality is quantified by a signal-to-noise-and-interference ratio (SINR), and wherein the selected signal instance has a highest SINR among the plurality of signal instances.

7. The method of claim 1, wherein the plurality of signal instances are associated with a single propagation path.

8. The method of claim 1, wherein the wireless communication system is a CDMA system.

9. The method of claim 1, wherein the wireless communication system is an IS-856 CDMA system.

10. A method for deriving sample timing for a plurality of signal instances received on a plurality of antennas at a receiver unit in a wireless communication system, comprising:

updating a loop filter for each of the plurality of signal instances based on an error metric derived for the signal instance;

estimating a signal quality of each of the plurality of signal instances;

comparing the estimated signal qualities of the plurality of signal instances;

selecting one of the plurality of signal instances based on a result of the comparing;

loading loop filter value for the selected signal instance onto the loop filter for each remaining one of the plurality of signal instances; and

deriving the sample timing for each signal instance based on an output of the loop filter for the signal instance.

11. The method of claim 10, further comprising:

deriving an error metric for each signal instance with an early/late discriminator and based on data samples for the signal instance.

12. A method for deriving sample timing for a plurality of signal instances received on a plurality of antennas and corresponding to a single propagation path at a terminal in a CDMA communication system, comprising:

deriving an error metric for each of the plurality of signal instances with an early/late discriminator and based on data samples for the signal instance;

estimating a signal-to-noise-and-interference ratio (SINR) of each of the plurality of signal instances;

comparing the estimated SINRs of the plurality of signal instances;

selecting a signal instance having a highest SINR;

updating a loop filter based on the error metric derived for the selected signal instance; and

deriving the sample timing for the plurality of signal instances based on an output of the loop filter.

13. The method of claim 12, further comprising:

resampling the data samples for each signal instance based on the derived sample timing to provide interpolated samples for the signal instance; and

processing late and early interpolated samples for each signal instance to derive the error metric for the signal instance.

14. The method of claim 13, further comprising:

processing on-time interpolated samples for each signal instance to derive the estimated SINR of the signal instance.

15. A method for deriving sample timing for a plurality of signal instances received on a plurality of antennas at a receiver unit in a wireless communication system, comprising:

deriving an error metric for each of the plurality of signal instances;

combining error metrics for the plurality of signal instances for each update period to provide a composite error metric for the update period;

updating a loop filter based on the composite error metric; and

deriving the sample timing for the plurality of signal instances based on an output of the loop filter.

16. The method of claim 15, further comprising:

scaling the error metric for each signal instance with a respective weight, and wherein scaled error metrics for the plurality of signal instances are combined to provide the composite error metric.

17. The method of claim 16, wherein the weight for each signal instance is determined based on an estimated signal quality of the signal instance.

18. The method of claim 15, further comprising:

estimating a signal quality of each of the plurality of signal instances, and wherein error metrics for signal instances having estimated signal qualities above a particular threshold are combined.

19. The method of claim 18, wherein the signal quality of each signal instance is quantified by a signal-to-noise-and-interference ratio (SINR).

20. The method of claim 15, wherein the error metric for each signal instance is derived with an early/late discriminator and based on data samples for the signal instance.

21. A method for deriving sample timing for a plurality of signal instances received on a plurality of antennas at a receiver unit in a wireless communication system, comprising:

deriving an error metric for each of the plurality of signal instances;

estimating a signal quality of each of the plurality of signal instances;

selecting one of a plurality of possible loop modes for a delay lock loop based on the estimated signal qualities of the plurality of signal instances;

updating a loop filter for the delay lock loop based on one or more error metrics for one or more selected signal instances and in accordance with the selected loop mode; and

deriving the sample timing for the plurality of signal instances based on an output of the loop filter.

22. The method of claim 21, wherein the plurality of possible loop modes includes a first loop mode wherein the sample timing for the plurality of signal instances is derived based on the error metric for the signal instance having a best estimated signal quality.

23. The method of claim 21, wherein the plurality of possible loop modes includes a second loop mode wherein the sample timing for the plurality of signal instances is derived based on error metrics for the plurality of signal instances.

24. A method for deriving sample timing for a received signal instance at a receiver unit in a wireless communication system, comprising:

estimating a signal quality of the signal instance for each of a plurality of different time offsets, wherein each time offset corresponds to a different sample timing for the signal instance;

updating a loop filter based on an error metric derived for the signal instance;

determining a nominal time offset to be used for the sample timing for the signal instance based on an output of the loop filter;

detecting for a change between a current and a prior nominal time offset;

if a change in the nominal time offset is detected,

comparing the estimated signal quality for the current nominal time offset to the estimated signal quality for the prior nominal time offset, and

retaining the current nominal time offset if the estimated signal quality for the current nominal time offset is better than the estimated signal quality for the prior nominal time offset.

25. The method of claim 24, further comprising:

if a change in the nominal time offset is detected,

retaining the prior nominal time offset if the estimated signal quality for the current nominal time offset is not better than the estimated signal quality for the prior nominal time offset.

26. The method of claim 24, wherein the signal quality of the signal instance is estimated for three different time offsets that include the nominal time offset, a second time offset that is +1 time unit from the nominal time offset, and a third time offset that is -1 time unit from the nominal time offset.

27. The method of claim 24, wherein a change is detected if a difference between the current and prior nominal time offsets is one or more time units.

28. The method of claim 26, wherein one time unit corresponds to 1/8 of a chip period.

29. The method of claim 24, further comprising:

deriving the error metric for the signal instance with an early/late discriminator and based on the nominal time offset.

30. The method of claim 24, wherein the estimated signal quality for the current nominal time offset, SINRa, is deemed to be better than the estimated signal quality for the prior nominal time offset, SINRb, if SINRa exceeds SINRb by a particular amount.

31. A memory communicatively coupled to a digital signal processing device (DSPD) capable of interpreting digital information to:

estimate a signal quality of each of a plurality of signal instances received on a plurality of antennas;

compare the estimated signal qualities of the plurality of signal instances;

select one of the plurality of signal instances based on a result of the comparing;

update a loop filter based on an error metric derived for the selected signal instance; and

derive the sample timing for the plurality of signal instances based on an output of the loop filter.

32. A method for deriving sample timing for a received signal instance at a receiver unit in a wireless communication system, comprising:

estimating a signal quality of the signal instance;

determining a current operating mode for a delay lock loop used use to provide the sample timing for the signal instance, wherein the delay lock loop is operable in one of a plurality of operating modes at any given moment; and

switching to a new operating mode for the delay lock loop if the estimated signal quality surpasses a threshold associated with the new operating mode.

33. The method of claim 32, wherein the plurality of operating modes include a normal mode and an enhanced mode.

34. The method of claim 33, wherein the normal and enhanced modes are associated with first and second thresholds, respectively, and wherein the first threshold is lower than the second threshold.

35. The method of claim 34, wherein a switch from the normal mode to the enhanced mode is made if the estimated signal quality exceeds the second threshold, and wherein a switch from the enhanced mode to the normal mode is made if the estimated signal quality falls below the first threshold .

36. A digital signal processor comprising:

at least one pilot processor operative to estimate a signal quality of each of a plurality of signal instances received on a plurality of antennas, and to derive an error metric indicative of error in sample timing for each signal instance;

a controller operative to compare the estimated signal qualities of the plurality of signal instances and to select one of a plurality of signal instances based on a result of the comparison; and

a loop filter operative to accumulate the error metric derived for the selected signal instance, and wherein the sample timing for the plurality of signal instances is derived based on an output of the loop filter.

37. A digital signal processor comprising:

at least one pilot processor operative to derive an error metric for each of a plurality of signal instances received on a plurality of antennas, wherein the error metric for each signal instance is indicative of error in sample timing for the signal instance; and

a loop filter operative to combine error metrics for the plurality of signal instances for each update period to provide a composite error metric and to accumulate the composite error metric, and wherein the sample timing for the plurality of signal instances is derived based on an output of the loop filter.

38. The digital signal processor of claim 37, wherein the loop filter is further operative to scale the error metric for each signal instance with a respective weight, and to combine the scaled error metrics for the plurality of signal instances to provide the composite error metric.

39. A digital signal processor comprising:

at least one pilot processor operative to estimate a signal quality of a received signal instance for each of a plurality of different time offsets, wherein each time offset corresponds to a different sample timing for the signal instance, and to derive an error metric indicative of an error in the sample timing for the signal instance;

a loop filter operative to accumulate the error metric derived for the signal instance; and

a control unit operative to determine a nominal time offset to be used for the sample timing for the signal instance based on an output of the loop filter, to detect for a change between a current and a prior nominal time offset, and to retain the current nominal time offset if a change in the nominal time offset has been detected and the estimated signal quality for the current nominal time offset is better than the estimated signal quality for the prior nominal time offset.

40. A digital signal processor of claim 39, wherein the control unit is further operative to retain the prior nominal time offset if a change in the nominal time offset has been detected but the estimated signal quality for the current nominal time offset is not better than the estimated signal quality for the prior nominal time offset.

41. A digital signal processor comprising:

at least one pilot processor operative to estimate a signal quality of a received signal instance and to derive an error metric indicative of an error in the sample timing for the signal instance;

a loop filter operative to accumulate the error metric derived for the signal instance; and

a control unit operative to determine a current operating mode for a delay lock loop implemented in part by the loop filter and used to provide the sample timing for the signal instance, wherein the delay lock loop is operable in one of a plurality of operating modes at any given moment, and wherein the control unit is further operative to switch to a new operating mode for the delay lock loop if the estimated signal quality surpasses a threshold associated with the new operating mode.

42. A receiver unit in a wireless communication system, comprising:

at least one pilot processor operative to estimate a signal quality of each of a plurality of signal instances received on a plurality of antennas, and to derive an error metric indicative of error in sample timing for each signal instance;

a controller operative to compare the estimated signal qualities of the plurality of signal instances and to select one of a plurality of signal instances based on a result of the comparison; and

a loop filter operative to accumulate the error metric derived for the selected signal instance, and wherein the sample timing for the plurality of signal instances is derived based on an output of the loop filter.

43. The receiver unit of claim 42, further comprising:

at least one sample buffer operative to store data samples for the plurality of signal instances.

44. The receiver unit of claim 42, wherein each pilot processor includes

an interpolator operative to resample data samples for a particular signal instance based on the derived sample timing to provide interpolated samples.

45. The receiver unit of claim 44, wherein each pilot processor further includes

an early/late discriminator operative to process late and early interpolated samples for the particular signal instance to derive the error metric for the signal instance.

46. The receiver unit of claim 44, wherein each pilot processor further includes

a signal quality estimator operative to process on-time interpolated samples for the particular signal instance to derive the estimated signal quality of the signal instance.

47. A terminal comprising the receiver unit of claim 42.

48. A base station comprising the receiver unit of claim 42.

49. A receiver apparatus in a wireless communication system, comprising:

means for estimating a signal quality of each of a plurality of signal instances received on a plurality of antennas;

means for comparing the estimated signal qualities of the plurality of signal instances;

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means for selecting one of the plurality of signal instances based on a result of the comparing;

means for deriving an error metric indicative of error in sample timing for the selected signal instance;

means for accumulating the error metric derived for the selected signal instance; and

means for deriving the sample timing for the plurality of signal instances based on the accumulated error metric.